Outpatient Encounters Associated with Diagnostic Codes for Migraine and Other Types of Headaches, Active Component Service Members, 1998-2010

This analysis examines incidence rates, prevalences, and outpatient encounters for migraine and other headache syndromes among active component members of the U.S. Armed Forces from 1998 through 2010. For both migraine and other headache syndromes, incidence rates, prevalences, and rates of outpatient encounters increased during the period. In 2010, 3.9 percent of male service members and 11.3 percent of females had at least one outpatient encounter for an episode of headache; rates were higher among females than males. Among service members ever diagnosed with migraine, 3 percent of men and 6 percent of women had more than 10 encounters for migraine; for other headache syndromes, the respective percentages were less than 1 percent. The introduction of new ICD-9 codes during the period had little effect on the coding practices for migraine, but did modestly affect the coding practices for other headache syndromes.

Migraine is a common disorder marked by episodes of moderate to severe headache (typically unilateral in adults); episodes are often accompanied by other symptoms such as nausea and vomiting, photophobia, and sensitivity to movement. Migraine headaches may be preceded by disturbances of perception (aura) involving the senses of vision, hearing, or smell. Attacks of migraine are often severe and may recur frequently enough that they interfere with activities of daily living; as such, migraines can significantly degrade the military operational effectiveness of affected service members.

It has been estimated that, among adults in the United States, migraine affects as many as 18 percent of women and 6 percent of men during their lifetimes.[1] A previous *MSMR* report showed that 25.6 percent of all outpatient health care visits for diagnoses categorized as "neurological disorders" in the military health care system from 1998-2010 were associated with diagnoses of migraine in the primary (first listed) diagnostic position of the health record.[2] However, studies have shown that most persons whose headache symptoms fit the clinical case definition of migraine have never been diagnosed with migraine by a physician and have used only over-the-counter pain medications to treat their symptoms.[1] The incidence and prevalence of migraine among women are estimated to be 3 to 5 times higher than among men.

Non-migraine headaches are also common. Most adults experience at least occasional headaches and have learned both to recognize them and to self-treat without seeking help from a health care provider. Following the introduction of a new set of 24 ICD-9-CM codes (339.xx) for "other headache syndromes" (under the category of "neurological disorders") in late 2008, 8.7 percent of all military health care system outpatient encounters for "neurologic disorders" in 2010 were associated with diagnoses of "other headache syndromes."[2]

This analysis examines the incidence, prevalence, and health care burden of outpatient care of active duty service members associated with diagnoses of migraine and other headache syndromes.

METHODS

The surveillance period encompassed the 13 years from January 1, 1998 through December 31, 2010. The surveillance population included all members of the active component of the U.S. Armed Forces who served any time during the surveillance period. Outcomes of interest were outpatient encounters for which "migraine" or "other headache syndromes" (i.e., non-migraine headaches) were recorded as primary (first-listed) diagnoses on standardized records of care (hospitalizations were not examined). Outpatient encounters of interest were identified from records maintained in the Defense Medical Surveillance System, an administrative database that includes records of medical encounters of members of the U.S. Armed Forces in military and civilian (reimbursed care) treatment facilities.

Migraine diagnoses were defined as conditions documented with any of the forty-two 3-, 4-, and 5-digit diagnostic codes included in ICD-9-CM disease category 346 "migraine." Diagnoses of other headache syndromes (hereafter referred to as "other headaches") were defined as conditions documented with any of the twenty-eight 3-, 4-, and 5-digit ICD-9-CM diagnostic codes that specify headache disorders not classified under "migraine." These include 307.80 (psychogenic pain, site unspecified), 307.81 (tension headache), 310.2 (postconcussion syndrome), 784.0 (headache), and the twenty-four codes (339.00 – 339.89) for "other headache syndromes" introduced into the ICD-9-CM system in late 2008.

Incident cases of migraine were defined as individuals with at least one outpatient encounter for which a migraine-specific ICD-9-CM diagnostic code was recorded as the primary (first-listed) diagnosis. The incidence date was the date of the first such encounter. Individuals who had received a diagnosis of migraine prior to the surveillance period were included. For incidence rate estimates, each affected individual was counted as an incident case of migraine only once during the surveillance period. For purposes of estimating period prevalences of and total outpatient encounters ("health care burden") associated with migraine, all migraine-specific

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14. ABSTRACT

Th is analysis examines incidence rates, prevalences, and outpatient encounters for migraine and other headache syndromes among active component members of the U.S. Armed Forces from 1998 through 2010. For both migraine and other headache syndromes, incidence rates, prevalences, and rates of outpatient encounters increased during the period. In 2010, 3.9 percent of male service members and 11.3 percent of females had at least one outpatient encounter for an episode of headache; rates were higher among females than males. Among service members ever diagnosed with migraine 3 percent of men and 6 percent of women had more than 10 encounters for migraine; for other headache syndromes, the respective percentages were less than 1 percent. Th e introduction of new ICD-9 codes during the period had little eff ect on the coding practices for migraine, but did modestly aff ect the coding practices for other headache syndromes.

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outpatient encounters were included. Denominators for the calculation of incidence rates and outpatient encounters of migraine were based on total person-years (p-yrs) of service in the active component minus p-yrs during deployment. For period prevalence rates, the denominator was the number of active component service members on active duty at the beginning of each year.

All service members who had at least one outpatient encounter for migraine were considered "migraine patients." Migraine patients were excluded from estimates of incidence and prevalence of "other headaches."

Incident cases of "other headaches" were defined as individuals who were not migraine patients (per definition above) and had at least one outpatient encounter for which any one of the ICD-9-CM codes indicative of "other headaches" was the primary (first-listed) diagnosis. The incidence date was the date of the first such encounter. Individuals who had received a diagnosis of "other headaches" or migraine prior to the surveillance period were included. For incidence rate estimates, each affected individual was counted as an incident case only once during the surveillance period. For purposes of estimating period prevalences of and outpatient care ("health care burden") associated with "other headaches," all such outpatient encounters were included. Denominators for the calculation of rates of "other headaches" were calculated like those for migraine.

In a separate analysis of the relationship between migraine and "other headaches," the health records of all "migraine patients" were examined to determine the frequencies of encounters for "other headaches" before and after incident diagnoses of migraine.

RESULTS

Migraine

During the 13-year surveillance period, there were 514,192 outpatient encounters of active component members with "migraine" as the primary (first-listed) diagnosis **(Table 1)**. The annual number of such encounters rose 127 percent from 1998 (24,609 visits) through 2010 (55,786 visits). Over the entire period, the increase in numbers of annual encounters for migraine was steady except for slight decreases in 2005 and 2006 **(Figure 1)**; of note, however, annual rates of incident diagnoses fell from 1998 (107.9 incident cases per 10,000 p-yrs) through 2001 (91.0 cases per 10,000 p-yrs) and then increased modestly through 2010 (129.4 cases per 10,000 p-yrs). The rate in 2010 was 42 percent higher than the lowest annual incidence rate (2001) of the period **(Figure 1)**.

The overall incidence rate of migraine was more than three times higher among females (332.8 cases per 10,000 p-yrs) than males (73.4 cases per 10,000 p-yrs). Among females, age-group-specific incidence rates sharply declined with increasing age. Similarly, among males, the lowest incidence rate affected the oldest age group (>44 years); in contrast to females, however, among males, rates were fairly similar across age groups other than the oldest **(Table 1).**

In general, period prevalences of migraine by year (the number of individuals with at least one migraine encounter during each calendar year per 10,000 population) increased during the surveillance period. For example, among both males and females, period prevalences were markedly higher in 2010 than in 1998 (period prevalences, 1998 versus 2010: males, 66.7 versus 123.4 per 10,000; change, +84.9%; females, 345.9 versus 600.5 per 10,000; change, +73.6%) **(Figure 2)**.

TABLE 1. Numbers and rates of encounters and incident cases of migraine and "other headaches" by gender, age, and service, active component, U.S. Armed Forces, 1998-2010

		Migraine		"Other headache" diagnoses	
No. of encounters 1998-2010		No.	Rate	No.	Rate
Males	All ages	259,451	180.7	444,378	325.8
	17-24	82,651	146.8	197,542	364.3
	25-34	99,491	192.3	151,709	311.5
	35-44	66,934	219.1	81,644	284.5
	>44	10,375	207.4	13,483	283.3
Females	All ages	254,741	1,016.4	153,264	758.2
	17-24	94,471	846.5	84,260	898.0
	25-34	102,311	1,135.0	46,570	664.0
	35-44	49,620	1,199.9	18,759	584.5
	>44	8,339	1,105.8	3,675	604.1
Incident cases 1998-2010		No.	Rate	No.	Rate
Males	All ages	103,055	73.4	258,719	194.3
	17-24	40,350	72.5	126,739	236.5
	25-34	37,210	73.9	81,744	172.8
	35-44	22,061	74.8	43,190	156.2
	>44	3,434	70.9	7,046	153.2
Females	All ages	75,363	332.8	92,270	518.5
	17-24	36,849	350.0	54,915	627.6
	25-34	26,114	330.2	25,849	437.5
	35-44	10,676	300.0	9,770	371.1
	>44	1,724	265.5	1,736	344.6
Males	All services	103,055	73.4	258,719	194.3
	Army	41,315	89.6	113,782	262.5
	Air Force	26,722	78.8	56,506	177.4
	Coast Guard	2,314	53.8	5,648	137.2
	Marine Corps	10,461	53.1	30,893	162.2
	Navy	22,243	61.2	51,890	149.2
Females	All services	75,363	332.8	92,270	518.5
	Army	28,216	369.0	38,975	653.3
	Air Force	25,366	340.1	26,774	474.4
	Coast Guard	1,267	242.7	1,433	329.1
	Marine Corps	3,036	236.9	5,114	458.7
	Navy	17,478	304.8	19,974	431.0

In addition, rates of total migraine-related outpatient encounters markedly increased during the period. For example, among both males and females, rates of total outpatient encounters for migraine more than doubled from 1998 to 2010 (annual rates of outpatient encounters for migraine, 1998 - 2010: males: 106.5 - 276.1 per 10,000 p-yrs; females, 600.0 - 1,366.6 per 10,000 p-yrs) **(Figure 2)**.

Among the Services, the highest overall incidence rates were among members of the Army and Air Force; and between these Services, among both males and females, overall incidence rates were higher among Army than Air Force members **(Table 1)**. Of note, however, the differences in incidence rates between Army and Air Force members – both males and females – markedly increased after 2004. As a result, for example, incidence rates were higher among women in the Army than those in the Air Force by 8.5 percent overall but 34.9 percent in calendar year 2010; similarly, incidence rates were higher among men in the Army than those in the Air Force by 13.7 percent overall but 80.5 percent in 2010 **(data not shown)**.

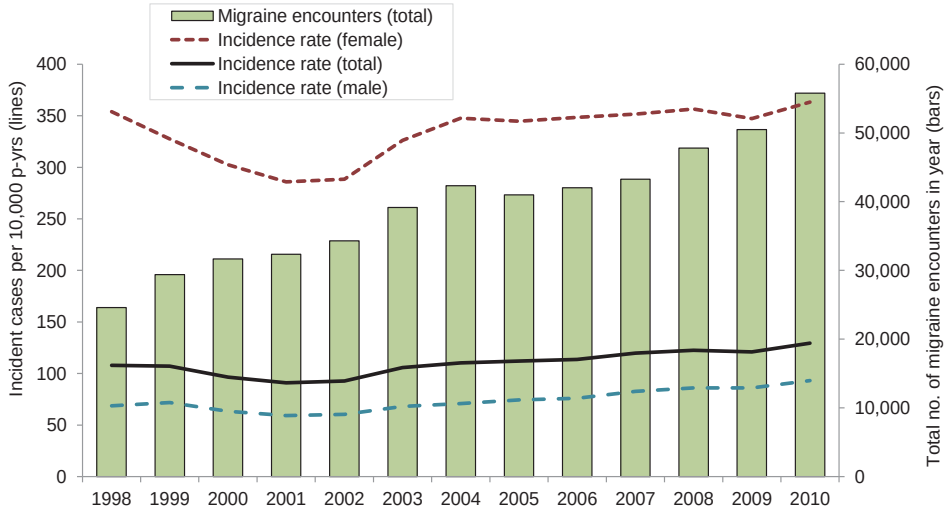
Among the 103,058 men who ever received a diagnosis of migraine, 59,215 (57.5%) had only one migraine-specific outpatient encounter. The overall average number of migraine encounters among affected men was 2.5; however, approximately 3 percent (n=3,050) of all affected men had more than 10 encounters each for migraine **(Table 2)**. Among the 75,367 women who ever received a diagnosis of migraine, 34,813 (46.2%) had only one migraine-specific outpatient encounter. The overall average number of migraine encounters among affected women was 3.4; however, approximately 6 percent (n=4,378) of all affected women had more than 10 outpatient encounters each for migraine **(Table 2)**.

"Migraine unspecified" (ICD-9-CM code: 346.9) was reported as the diagnosis for nearly two-thirds (62.3%) of the 514,192 outpatient encounters in which migraine was the primary diagnosis. Diagnoses of "migraine without aura" (ICD-9-CM code: 346.1) and "migraine with aura" (ICD-9-CM code: 346.0) accounted for an additional 17.0 percent and 12.2 percent, respectively, of all migraine-specific outpatient encounters. Of interest, the 30 migraine-specific ICD-9-CM codes added to the category of "migraine" (ICD-9-CM code: 346) in 2008 accounted for only 0.5 percent of all migraine diagnoses during the 13 year surveillance period and only 2.7 percent of all migraine diagnoses in calendar year 2010 **(data not shown)**.

TABLE 2. Numbers of encounters for "migraine" and "other headaches," by gender, active component, U.S. Armed Forces, 1998-2010

	Migraine patients' migraine encounters			Encounters for patients with only "other headaches"	
Males	No. of persons	Cumulative percentage of all encounters	No. of encounters	No. of persons	Cumulative percentage of all encounters
	59,215	22.8	1	182,481	41.1
	40,793	77.8	2 - 10	73,992	90.5
	2,283	90.1	11 - 20	1,684	95.8
	471	94.5	21 - 30	338	97.6
	296	100.0	Over 30	227	100.0
Females	No. of persons	Cumulative percentage of all encounters	No. of encounters	No. of persons	Cumulative percentage of all encounters
	34,813	13.7	1	61,405	40.1
	36,176	67.6	2 - 10	30,548	96.6
	3,268	85.7	11 - 20	265	98.9
	681	92.2	21 - 30	34	99.4
	429	100.0	Over 30	20	100.0

FIGURE 1. Incidence rates of migraine clinic encounters by gender and numbers of migraine encounters, active component, U.S. Armed Forces, 1998-2010

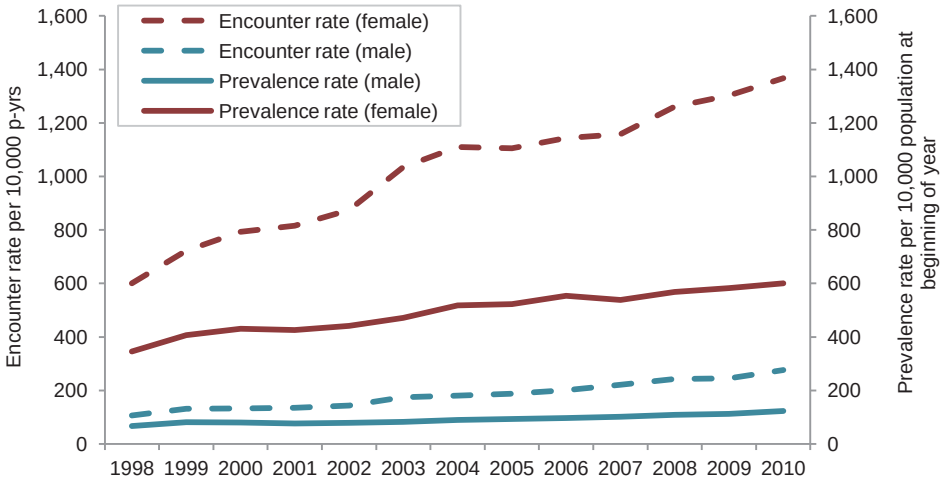


"Other headaches"

During the surveillance period, there were 597,642 outpatient encounters with primary diagnoses of "other headaches" among active component service members who had never been diagnosed with "migraine." The annual number of such encounters declined by 13 percent from 1998 (n=39,024) through 2005 (n=33,877) and then sharply increased through 2010 (n=75,643); as such, the number of encounters in 2010 was 123 percent higher than in 2005 **(Figure 3)**.

There was a similar trend of decreasing and then sharply rising rates of incident diagnoses of non-migraine headaches during the period. Annual incidence rates declined from 1998 (233.4 incident cases per 10,000 p-yrs) through 2005 (194.0

FIGURE 2. Annual prevalence rates and rates of encounters for "migraine," by gender, active component, U.S. Armed Forces, 1998-2010.



cases per 10,000 p-yrs) and then increased steadily through 2010 (302.4 cases per 10,000 p-yrs); as such, the rate in 2010 was 56 percent higher than in 2005 **(Figure 3)**.

The overall incidence rate of "other headaches" was much higher among females (518.5 cases per 10,000 p-yrs) than males (194.3 cases per 10,000 p-yrs). Among both males and females, incidence rates declined with increasing age **(Table 1)**.

Estimated period prevalences (total persons with at least one "other headache" encounter per 10,000 population per year) decreased from 1998 through 2005 and then increased steadily through 2010. As such, period prevalences were 78.5 percent and 52.7 percent higher among males and females, respectively, in 2010 than 2005 **(data not shown)**. Similarly, rates of all outpatient encounters for "other headaches" (per 10,000 p-yrs) rose from 1998 through 2010 among both males (231.7 in 1998 to 569.6 in 2010) and females (740.9 in 1998 to 1,041.5 in 2010) **(data not shown)**.

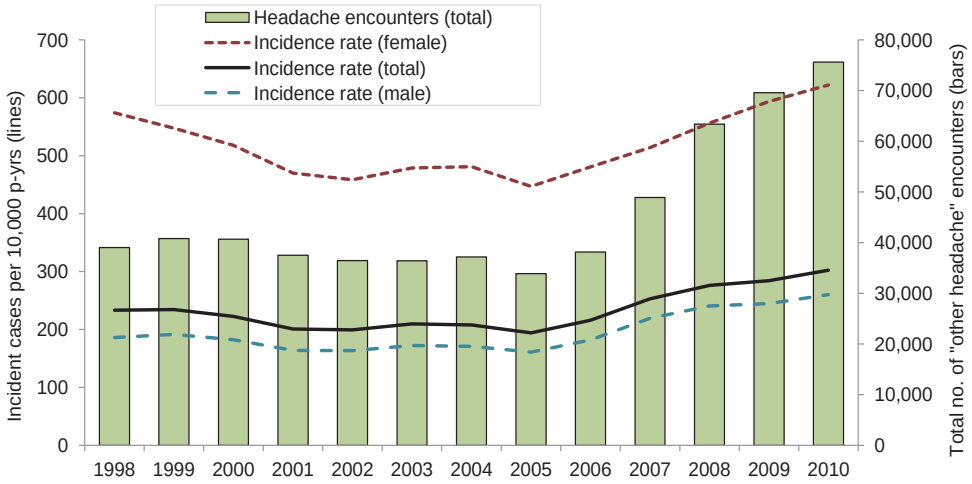
Among the Services, the highest overall incidence rates of non-migraine headache diagnoses were among Army and Air Force members **(Table 1)**. Among members of these services, overall incidence rates were much higher among both female (37.7%) and male (29.3%) Army than Air Force members **(data not shown)**.

Of the 258,719 men who were diagnosed with a non-migraine ("other") headache and never a migraine, 182,481 (70.5%) had only one non-migraine headache-related outpatient encounter during the period. Among men diagnosed with "other headaches" (but not migraine), the average number of "other headache"-specific encounters was 1.7; fewer than 1 percent (n=2,249) had more than 10 "other headache"-specific encounters **(Table 2)**. Of the 92,270 women who were diagnosed with a non-migraine ("other") headache and never a migraine, 61,405 (66.5%) had only one "other headache"-specific outpatient encounter during the period. Among women diagnosed with "other headaches" (but not migraine), the average number of encounters for "other headaches" was 1.7; fewer than 1 percent (n=319) had had more than 10 "other headache"-specific encounters **(Table 2)**.

"Headache" (ICD-9-CM code: 784.0) was reported as the diagnosis for approximately three-fourths (73.3%) of the 597,642 encounters with "other" (non-migraine) headache-related diagnoses as primary diagnoses. Diagnoses of "postconcussion syndrome" (ICD-9-CM code: 310.2), "tension headache" (ICD-9-CM code: 307.81) and "other headache syndromes" (ICD-9-CM code: 339.89) accounted for an additional 10.2 percent, 8.9 percent, and 4.7 percent, respectively, of all "other headache"-specific encounters **(data not shown)**.

In 2008, 24 diagnostic codes were added to the ICD-9-CM category of "other headaches" (ICD-9-CM code: 339). These new codes accounted for 6.9 percent of all "other headache"-specific diagnoses during the entire surveillance period but 29.0 percent of all such encounters in calendar year 2010; "other headache syndromes" (ICD-9-CM code: 339.89) accounted for more than two-thirds (68%) of all uses of the new "other headache"-specific codes in 2010 **(data not shown)**. Other new codes that have been relatively frequently used since 2008 specify post-traumatic headache (ICD-9-CM code: 339.20-339.22) (15% of new code use) and tension headache (ICD-9-CM codes: 339.10-339.12) (11% of new code use).

FIGURE 3. Incidence numbers and rates of "other headache" clinic encounters, by gender, active component, U.S. Armed Forces,1998-2010.



"Other headaches" among migraine patients

Of all men and women identified as "migraine patients" during the surveillance period, 62 percent (n=63,894) and 57 percent (n=42,918), respectively, had no encounters for "other headaches" prior to their first diagnoses of migraine. Similarly, after their incident diagnoses of migraine, 63 percent (n=64,974) of men and 56 percent (n=42,138) of women had no subsequent diagnoses of "other headaches" **(Table 3)**. Although most migraine patients were not diagnosed with "other headaches" before or after their migraine diagnoses, migraine patients did account for 372,976 outpatient encounters for "other headaches" during the surveillance period.

TABLE 3. Numbers of encounters for "other headaches" among migraine patients before and after their initial diagnosis of migraine, by gender, active component, U.S. Armed Forces, 2011

	Before 1st migraine			After 1st migraine	
	No. of persons	Cumulative percentage of all encounters	No. of "other headaches" encounters	No. of persons	Cumulative percentage of all encounters
Males	63,894		0	64,974	
	19,903	21.7	1	17,508	15.0
	18,603	88.0	2 - 10	18,915	73.2
	659	100.0	Over 10	1,657	100.0
Females	42,918		0	42,138	
	16,723	24.5	1	14,692	15.3
	15,504	95.3	2 - 10	17,442	80.1
	218	100.0	Over 10	1,097	100.0

Outpatient health care burdens for headache syndromes (migraine plus "other headaches")

During the period, "migraine patients" accounted for 514,192 migraine-specific and 372,976 "other headache"-related outpatient encounters. In addition, service members who were never diagnosed with migraine accounted for 597,642 outpatient encounters for "other headaches." During the entire period, migraine and other headaches accounted for 1,484,810 outpatient encounters; and during calendar year 2010 alone, migraine and "other headaches" accounted for 160,916 outpatient encounters. In 2010, headache syndromes accounted for approximately 8 of every 1,000 outpatient encounters of U.S. service members in the U.S. Military Health System.

EDITORIAL COMMENT

This analysis documented increasing rates of incidence, annual prevalence, and annual numbers of outpatient encounters for migraine among U.S. military members during the period 1998-2010. Rates among females were 3- to 4-times higher than among males. Appreciable numbers of service members (more than 3,000 males and 4,000 females) had more than ten outpatient encounters associated with primary diagnoses of migraine during the period. The most frequently recorded migraine diagnoses were "migraine unspecified" (ICD-9-CM code: 346.9), "migraine without aura" (ICD-9-CM code: 346.1) and "migraine with aura" (ICD-9-CM code: 346.0), together accounting for 91.5 percent of all migraine diagnoses. The addition of 30 new ICD-9-CM codes to the category of "migraine" (ICD-9-CM code: 346) in 2008 had little apparent impact on the increasing frequency of migraine diagnoses.

For "other headaches" there were also overall increases in the rates of incidence, annual prevalence, and annual numbers of outpatient encounters during the surveillance period. Female rates were over twice as high as those among males. Repeated "other headaches" encounters were not as common as was the case with migraine, but there were still over 2,000 males and over 300 females who had more than ten encounters for "other headaches" during the surveillance period. The introduction in 2008 of 24 new ICD-9-CM codes for "other headaches" resulted in subsequent changes in the relative proportions of the most frequently recorded diagnostic codes. The relatively non-specific diagnoses of "headache" (ICD-9-CM code: 784.0, an older code) and of "other headache syndromes" (ICD-9-CM code: 339.89, a new code) predominated and accounted for 75 percent of "other headaches" recorded in 2010. A pattern of increasing use of new codes for "post-traumatic headache" and "tension headache" were accompanied by drops in the frequency of use of the older codes for "post-concussion syndrome" and "tension headache."

In light of published estimates of prevalences of migraine in the U.S. general population, the results of this study suggest a significant underestimate of the incidence and prevalence of migraine in U.S. military members. For example, period prevalence estimates of migraine in this study are not estimates of lifetime prevalence but rather of prevalence during military service. Also, this study relied upon diagnoses recorded during outpatient encounters. Clinicians may be reluctant to record a specific diagnosis of migraine in the absence of a patient history that satisfies the consensus clinical case definition. Even among patients in this study who were diagnosed with migraine, more than half of them had only one visit in which that diagnosis was recorded. If patients with mild forms of migraine are not initially diagnosed with migraine but obtain satisfactory relief from their symptoms and do not return for follow-up care, then the specific diagnosis of migraine may not be documented. The literature indicates that most patients with migraine are never given "migraine" diagnoses by a physician; if so, it is likely that the same shortfall in case ascertainment applies to the military health care system.[1,3]

This study showed that it was common for eventual "migraine patients" to have numerous visits for "other headaches" before their first migraine encounters. It is likely that a methodical, case-finding survey of service members would disclose many migraine patients – perhaps a majority – for whom that specific diagnosis does not appear in their health care records.

Factors that result in underestimates of the incidence and prevalence of migraine among military members may similarly affect estimates of the incidence and prevalence of "other headaches."

In 2010, 1.2 percent of active component male service members and 6.0 percent of females had outpatient encounters for migraine; an additional 2.7 percent of males and 5.3 percent of females had encounters for "other headaches." Together, these data document that 3.9 percent of male service members and 11.3 percent of female service members had at least one outpatient encounter for an episode of headache (migraine or "other headaches") in 2010. These proportions for 2010 are the highest since the beginning of the surveillance period in 1998.

The ratio of the migraine incidence rate among females to the rate among males during the entire surveillance period was 4.5, a figure consistent with the published literature. However, that ratio steadily declined from 2004 (ratio of 4.9) through 2010, when the ratio of 3.9 was the lowest in the entire period. A similar trend was apparent for the female to male ratio of annual prevalence rates (2004 ratio 5.7; 2010 ratio 4.9). The changes in these female to male ratios were taking place during a period when both incidence and prevalence rates of migraine were steadily rising among both females and males. Previous studies have found associations between the incidence of migraine and other headache symptoms and deployment to southwest Asia. Factors that appeared to be associated with increased incidence of migraine or other headache disorders included deployment itself as well as diagnoses of concussion, anxiety disorder (including post-traumatic stress disorder), and depression.[4,5,6] It is also worth noting that the post-deployment screening of service members for mild traumatic brain injury has become more thorough and systematic in recent years. It is plausible that enhanced scrutiny of service members following their return from the combat zones of southwest Asia has resulted in the identification and health care follow-up of increasing numbers of service members who might otherwise not have been diagnosed with specific headache syndromes such as migraine and "other headaches."

Lastly, this analysis demonstrates that almost one percent of all outpatient care in the military health care system result in primary diagnoses of headache syndrome. Moreover, about 4 percent of all service members had at least one outpatient encounter for a headache syndrome in 2010. The burdens of health care and lost duty time associated with headache are substantial.

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